COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

JANE SWIFT
Governor

BOB DURAND
Secretary

LAUREN A. LISS
Commissioner

MASSACHUSETTS INLAND WETLAND REPLICATION GUIDELINES

Effective Date: March 1, 2002 Guidance No.: BRP/DWM/WetG02-2

Program Applicability: DEP Wetlands Program and Office of Administrative Appeals, local Conservation Commissions, environmental permitting consultants, and the general public

Approved by: [SIGNED]
Cynthia Giles, Assistant Commissioner
Bureau or Resource Protection

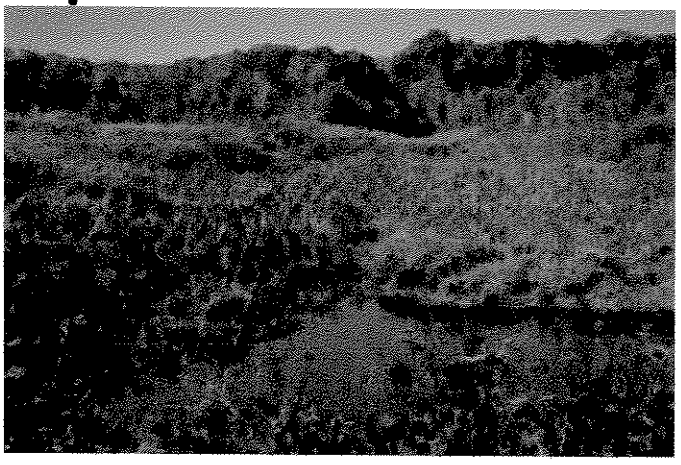
Copies of the Inland Wetland Replication Guidelines may be obtained from DEP's WE B site (http://www.mass.gov/dep) or by mail beginning in April, 2002. For further information contact DEP Wetlands Program, One Winter St., 6th Floor, Boston, MA 02108.

Rec'd 12/5

Massachusetts Department of Environmental Protection

Bureau of Resource Protection
Wetlands and Waterways Program

Massachusetts Inland Wetland Replication Guidelines



March 2002

Although not a specific requirement in the wetland regulations, it is recommended that wildlife habitat mitigation be designed by an individual with at least a master's degree in wildlife biology or ecological science from an accredited college or university, or other competent professional with at least two years experience in wildlife habitat evaluation. This would be consistent with the required credentials for a person conducting a wildlife habitat analysis under 310 CMR 10.60.

Changes to wildlife habitat may not be directly related only to the size of a project, but can also result from secondary impacts such as fragmentation of habitat caused by roadways and the loss of surrounding upland buffer areas. Many wetland-dependent wildlife species are already listed as rare or endangered or are experiencing population declines. In particular, small, slow-moving species, which depend on both wetlands and adjoining uplands, are threatened severely by roadway crossings and buffer zone clearing. Continued loss and fragmentation of wetlands, combined with inadequate protection of adjoining upland buffer zone habitat, will exacerbate this situation. To address this problem, Conservation Commissions should require applicants to address not just the size of the impacted wetland, but its specific ecological functions. See Table on page 8.

2.4 Replication Area Design & Application Requirements

The replication area must be designed to ensure that the interests of the Wetlands Protection Act will be protected. This requires different amounts of detail depending on the size and complexity of the replication area. Applicants should provide the following information as part of their permit application describing both the existing wetland to be altered, and the replication site. Appendix 3 includes an example replication checklist.

2.4.1. Narrative Description

A narrative description of the existing wetland (in general terms) and proposed wetland (more detailed) should include descriptions of water flow in and out (surface water and groundwater hydrology), wetland vegetation (especially species and their relative cover, and interspersion and diversity of various cover types), soils, proximity to other wetlands, and underlying geological conditions. The specific type of wetland the applicant proposes to create (e.g. wet meadow, marsh, shrub-scrub, or forested) should be included. The description should document how the replication plan adheres to the performance standards and how the functions of the existing wetland will be replicated.

A narrative and plans as appropriate should be included that describes replication area either on or off site. Conservation Commissions may request that the applicant consider alternative sites if they find that the proposed site is unlikely to be successful. The information should include but not be limited to the following considerations:

1. Description of how the site(s) are likely to meet the criteria defined in 310 CMR 10.55 (4);
2. **An assessment of the functions and values of the existing and proposed wetland areas with respect to the public interests;**

3. Compatibility with undesirable neighboring land uses. For example, replicated wetlands adjacent to hazardous waste sites or downstream of parking lots, snow disposal areas or roadways may receive large inputs of pollutants (including salt) that may affect their ecological functions. **Replication sites adjacent to high intensity land uses are less likely to provide the full range of wildlife habitat and other ecological functions of the impacted wetland. Applicants should address whether replication areas near undesirable land uses will meet the performance standards.**
4. Topographic and geologic considerations may affect construction feasibility in the event large amounts of fill or bedrock require removal to achieve appropriate grades.
5. Soils must be examined for composition, distribution and depth; soil chemistry (i.e. redoximorphic features and ph) should be considered.
6. Hydrological considerations include 1) area of contributing watershed; 2) water budget inputs and outputs; 3) elevation of seasonal high and average groundwater table; 4) boundaries of wetlands; and 5) seasonal changes.
7. **Applicants should consider avoiding valuable upland wildlife habitats such as mature forests so that inadvertent impacts to upland animal or plant species do not result. Replication is required, however, even if the only feasible site is forested. If this is the case, applicants may choose to consider potential areas off-site prior to using forested uplands. Upland rare species habitat and vernal pools should also be avoided.**

   It is important to note that Conservation Commissions have no jurisdiction over upland areas adjacent to inland wetlands under the Wetland Protection Act unless they are buffer zones, riverfront area or bordering land subject to flooding. Any measures taken to avoid valuable upland habitats that are non-jurisdictional are strictly voluntary by the applicant.

2.4.2 Plan

A site location map such as a 1" = 2000' USGS locus depicting the geographic relationship between the impacted and proposed wetlands should be included. A plan showing the size and location of the existing and replicated wetland, at a scale in the range of 1"=10' to 1" = 40' should also be submitted, including easily identifiable landmarks such as surveyed flag locations, benchmarks, or structures. Plans should be developed with contour lines at 1-foot intervals in and around existing wetland and replication areas. Grading should demonstrate elevation differences required for different vegetation classes (forested, shrub, herbaceous, open water). In addition, the locations of hydrology test pits or other data collected, soil test pits and vegetation plots should be specified. Conservation Commissions should require that a Professional Land Surveyor (PLS) and/or a Registered Professional Engineer (PE) stamp plans.

Plans should also include details on any proposed planting or seeding plans and detail on the soil profile to be created. Location and extent of general wetland cover types and detail on the plant

composition and spacing proposed within each cover type is recommended, especially for more complicated sites with one or more vegetation types.

It is important to note all details proposed in the Notice of Intent and required in the Order of Conditions on the plan, since it is often the most used tool by the contractor to construct the replication area. **Make sure to include equipment access and storage areas as well.**

2.4.3 Surface Area Calculations.

The regulations require that replication areas be designed at a 1:1 replacement to impact ratio after avoidance and minimization efforts are complete. **Applicants may wish to consider a replication area greater than 1:1 in order to ensure the success of at least 1:1. A higher replacement to impact ratio may decrease the chances that a replication site will fail because it provides a contingency in the event of unforeseen circumstances such as mortality of vegetation, layout errors during construction, accidental encroachment and erosion and sedimentation. It is important to make sure that the side slopes of the replication area are not counted as part of the replication area or the final wetland will be smaller than required. This information should be included on the plans and in narrative form.**

2.4.4 Cross-Sections

Cross-sections of the proposed wetland subsurface, showing soil types, depths, and locations, and if applicable, the 100-year floodplain elevation should be depicted using both horizontal and vertical scales. Also include predicted high and low ground water elevations, perched ground water conditions, and other indicators of surface or ground water hydrology including direct observations and soil characteristics. Locations of cross-sections should be indicated on the plan view.

2.4.5 Stormwater Management

One of the intents of the Massachusetts Stormwater Management Policy (MSWMP) is to protect wetlands from becoming degraded from untreated stormwater discharges. Best Management Practices (BMP's) are built to treat the stormwater prior to discharge to natural wetlands. Some of these BMP's are man-made "constructed wetlands". In the event that a "constructed wetland" is used for required stormwater compliance purposes, the area shall not be included as replication credit for an impacted wetland resource area. **If any stormwater is to be directed to bona-fide replicated wetland, the stormwater shall be treated prior to discharge in accordance with the MSWMP. This means that stormwater must meet all 9 stormwater policy standards before it can be discharged to a replicated wetland (e.g. replicated wetlands cannot be used for removal of total suspended solids, nor can they be used for on-site detention of stormwater volume for peak rate attenuation, even if 80% TSS removal is accomplished beforehand).**

If stormwater is to be recharged, care must be taken to ensure the groundwater flow path will supply the replicated area. Fully treated stormwater may be useful in supporting the hydrology of replicated wetlands. **Replication areas for freshwater wetlands should be located away from snow disposal areas. If a replication area may be impacted by road salting operations, care should be taken in the design to avoid or minimize such effects.**

2.4.6 Erosion Control Plan

An erosion control plan showing how the applicant will stabilize all ground surfaces to prevent erosion should also be included within the application. Upon completion of the replication area, consideration should be given to the installation of siltation fencing between the replication area and the adjacent upland (if the adjacent upland will be disturbed during construction) to prevent sediments from entering the replication area. Prior to permanent establishment of vegetation in the replication area, soils should be temporarily stabilized to prevent impacts from erosion by mulching and seeding with a wetland seed mixture until re-establishment of wetland vegetation occurs. Hydro seeding is a valuable erosion control measure and may discourage colonization by invasive species. Caution is suggested in use of hay bales due to the possible inclusion of invasive seeds within the bales. If hay bales are to be used, the source site should be documented to be free of invasive wetland plants such as Purple Loosestrife and Phragmites. If invasive wetland plants are found at the source site then silt fence only or other erosion control measures should be considered. A commitment to remove erosion control measures following site stabilization and approval by the issuing authority should be included.

All embankment slopes adjacent to wetland replication areas should have slopes no greater than 2H: 1V unless stabilized by structural means. Bioengineering stabilization methods are recommended for slope stabilization.

3.0 Considerations During Construction

3.1 Schedule & Sequencing

The wetland replication plan should include a schedule showing the sequence of major construction steps and compliance monitoring. **The schedule should include the proposed dates for the start of construction, and for each procedure included in the replication plan.** Provisions should be included for surveying of finished elevations throughout the construction period in order to make appropriate adjustments due to compaction. In addition, contact information for the contractors and wetland consultants should be included.

If the flags placed during permitting are not clearly visible, flags should be replaced before construction begins. Flagging should include both the wetland to be altered and the location of the replication site. The flagging should clearly identify the limits of work in the existing wetland to avoid unintended impacts.

When possible, the replication area should be excavated and graded to the specifications in the plan before work in the existing wetland begins. The Conservation Commission should be given adequate notice prior to commencement of excavation for the wetland replication area so that inspection may be completed during the excavation procedure. Depending on the conditions encountered, the Conservation Commission may request modifications to the replication area design or location. Organic soils and wetland vegetation should not be placed in the replication area until the wetland scientist has verified that the final excavated grade for the replication area will allow the finished grade of the replication site to meet the design specifications in the replication plan. **The replication project should be substantially complete before existing wetlands are impacted (however, if use of soils or vegetation from the impacted wetland is proposed, the disturbance necessary to remove the wetland soils or vegetation may precede completion of the replication site). In any case, the proposed replication area should be excavated prior to filling the wetlands to be altered.**

Following excavation work, final grading and landscaping should be completed as soon as possible to minimize erosion. The overall construction schedule should be planned so that soils or vegetation are not stockpiled for an extended period of time. All exposed soil should be stabilized using seed-free mulch or other appropriate erosion control measures in the event that seasonal conditions result in a delay in planting. **If the site is excavated to the sub grade in the fall and a delay is inevitable, consideration should be given to stabilizing the site for winter, and conducting final grading in the spring.** Use of hydro seeding has been found to stabilize a site quickly and may possibly hinder growth of invasive species. Erosion control measures such as hay bales and silt fences shall be removed as soon as the site is stable to allow for proper hydrologic conditions.

4.0 Monitoring Requirements

Monitoring is critical in wetland replication efforts due to the complex issues that can arise when trying to replace the specific ecological conditions of wetlands. Monitoring to ensure that the project is built according to the design specifications will ensure that the most common cause of failure is avoided. A project monitor (preferably a qualified professional with training in wetland science) with a minimum 5 years of experience in the construction of wetland replication areas and general construction practices should be on-site to monitor the excavation, grading, and planting of the replication area (at the end of the first growing season, a professional with less than 5 years experience in wetland replication construction may conduct the monitoring if supervised by a professional with at least 5 years experience). The application should include specific monitoring plans and schedules for reporting to the issuing authority. An example checklist is included as Appendix 4. The project supervisor or monitor should be present during the most important tasks in replication construction including:

1. Before excavation or erosion control installation work begins to inspect site flagging;
2. During excavation of the altered area if vegetation is to be translocated to the replication area to ensure survival of the plantings;

3. Before soil translocation or addition into the replication area to inspect excavated elevations and likely post-construction ground water elevations for the replication area;

4. After each stage of grading work is completed to inspect finished elevations;

5. During planting and seeding and after the first month of the growing season to inspect propagation techniques;

6. **After one growing season to observe vegetation development and regulatory compliance;**

7. **After two growing seasons to determine vegetation development and regulatory compliance**

8. After subsequent growing seasons, if a greater than 2-year monitoring program is required.

A project should have a monitoring report submitted in the late spring and at the end of each of the first two growing seasons at a minimum. Monitoring should be required until regulatory compliance goals are met. Reports should include recommendations for additional plantings should the replication area appear to be unlikely to meet the 75% reestablishment standard (note that the 75% revegetation may include volunteer hydrophytic species as well as replacement plantings and seeding).

Monitoring for invasive species should also be conducted and any invasive handpicked before becoming widespread and established. Each monitoring report should project potential successional patterns based on observed establishment of vegetation. The final monitoring report should be accompanied by an as-built plan. The final monitoring report should indicate the conditions at the replication site (including stabilization of embankments), and describe in detail how the functions of the impacted wetland have been replaced by the development of the replication site. See the example-monitoring sheet in Appendix 4. Should the replication area fail to achieve the standard of 75% wetlands vegetation within two growing seasons, the Conservation Commission should require additional contingency measures and a Certificate of Compliance should not be issued until regulatory compliance is achieved.

Commissions should require that all replication plans include a narrative specifying target rates of survivorship, and alternative plans for plants or vegetative communities that do not become established successfully. Applicants should be prepared to mobilize after the completion of construction in the event that the replication area is not successful as determined by the Conservation Commission. A description of who will be responsible for post-construction remedial actions should be included in the Notice of Intent and Order of Conditions.

It is suggested that each Conservation Commission maintain records of replication projects in their town. The records are a valuable tool for the Commission to help learn from experience what approaches work well in the area, and to document reasons for project failure.

5.0 Issuing a Certificate of Compliance

The issuance of a Certificate of Compliance is an important step in ensuring a successful replication area. Commissions should review the following list prior to issuing a Certificate of Compliance. Commissions can deny a request for Certification if replication areas do not meet the 75% wetland plant criteria or are not constructed as designed or conditioned.

1. An as-built plan stamped by a R.L.S. or P.E. should be submitted that documents the construction of the replication area. The size of the replication area should be documented as consistent with the size proposed.

2. A site visit should be conducted prior to issuing a Certificate of Compliance. The replication area should be compared with the design plans and the Order of Conditions to ensure that it has been constructed as proposed and wetland interests have been replicated.

3. At least 75% of the surface area of the replication site should be reestablished with indigenous wetland species within two growing seasons. A qualified wetland professional should certify to the plant species composition of the area and compliance with this condition. The qualified wetland professional should also certify that the plants proposed in the planting plan are those that were planted, in the correct number, and the spacing of the plantings. The Order of Conditions may be extended if it is about to expire but the replication area has not fully established itself through two growing seasons. Each different layer of wetland vegetation (forested, shrub, herbaceous etc.) should be checked to ensure that it is surviving as designed and that the hydrology is appropriate.

4. Vegetation should be checked to ensure that no invasive species are colonized in the replication area. If so, measures should be taken to eliminate the invasive species.

5. All surrounding buffer zone areas should be stabilized. Inspections should be conducted of erosion control devices such as hay bales and silt fences and those devices should be removed once the site is stabilized. A Certificate of Compliance should not be issued until all erosion controls are removed and any soils disturbed by their removal stabilized.

6. Any drainage feature that supplies water to the replication areas should be checked to ensure a free-flow without clogging from sediments, trash or other impediments.

Conservation Commissions should deny requests for Certificate of Compliance if replication areas are not adequate and/or not substantially in compliance with the Order of Conditions. Procedurally, Commissioners can allow additional time for plantings or remedial work to reach compliance by extending an Order of Conditions, requiring submission of a new Notice of Intent

if the Order has expired, or issuing an enforcement order if they cannot get compliance voluntarily. The Certificate of Compliance should be recorded in the Registry of Deeds.

6.0 Conclusions

Protection of the wetland resources in the Commonwealth cannot be successful unless permitted wetland losses are adequately mitigated by successful replication projects. Improvement in the success of replication projects can be accomplished if all of the critical steps outlined above are followed when handling projects with wetland replication. Replication plans should be carefully analyzed using the checklists provided to ensure that appropriate requirements are included. The project should be monitored at appropriate points before, during and after construction, so that mid-course corrections can be made if necessary. Appendix 5 describes *Common Mistakes and Problems* and should be referenced during project design and implementation. Finally, Certificates of Compliance should only be issued when the project has met all of the appropriate requirements. Following these critical steps in accordance with the guidance provided here will ensure that the public interests in the wetlands of the Commonwealth will be protected.

Appendix 5. Common Mistakes and Problems

1. Stormwater detention basins are not wetland replication areas. Such basins are drainage structures and need to be maintained (cut, dredged etc). RECOMMENDATION: Include maintenance provisions in Order of Conditions for detention basins and require that replication areas not be used as stormwater structures.

2. Side slopes of the proposed replication area are not accounted for, and the final replicated wetland is smaller than required. RECOMMENDATION: During the permitting process review plans to be sure that side slopes do not extend into replication area. The issuing authority should require an inspection immediately after excavation of replication area.

3. Monitoring is rarely carried out and the vegetation dies and is not replaced. RECOMMENDATION: It is critical to check plant viability and replant if necessary before issuing a Certificate of Compliance. Include a condition in the Order requiring written monitoring reports at regular intervals and make sure the plan includes adding vegetation if it is anticipated that the site will not meet 75% after the first year.

4. Replication site too dry. RECOMMENDATION: Bottom elevations should be surveyed and if necessary, additional grading should be conducted to try and achieve the proper hydrology. The wetland monitor should determine the groundwater elevations before allowing organic soils to be added to ensure that elevations are low enough to ensure adequate hydrology. Monitor seasonal groundwater elevations in the replication area.

5. Replication site too wet. RECOMMENDATION: Wetland soils should be added to the site to ensure proper grades. Grades in the replication area should be surveyed to determine exactly how much fill is needed to achieve design elevations. Groundwater data collected during design should be reevaluated and the design adjusted to establish proper elevations for the proposed vegetation.

6. The applicant constructs the project first and fails to complete the replication area as required. RECOMMENDATION: Require wetland replication to be an initial phase of the project. Commissions should follow up with the landowner, applicant and the wetland specialist identified in the application immediately during construction to obtain voluntary compliance and a milestone schedule for completion. If the replication area is not completed, a Certificate of Compliance should not be issued. Enforcement action should be taken if voluntary compliance cannot be achieved.

7. The replication area is deeper than the adjacent wetland, resulting in a change in hydrology and drying out of adjacent wetland. RECOMMENDATION: Review the cross-sectional information for groundwater depths and depth of replication area and make appropriate changes.

8. The plants proposed for the replication area are not common in nearby wetlands. RECOMMENDATION: Plants should reflect the species density and composition in the altered area. Require native species that are common in your town.

9.The topography is at insufficient detail to accurately assess groundwater elevations, compensatory storage requirements, and resulting hydrology. RECOMMENDATION: Require surface elevation data be shown at 1-foot contours.

10.Invasive species are beginning to colonize in the replication area. RECOMMENDATION: Avoid using soils or plants from areas containing invasive species. Require monitoring and if found, removal during the first growing season and in subsequent years after (if necessary).

11.Wildlife habitat functions not replicated. RECOMMENDATION: Require plans to reproduce existing wildlife habitat features of the plant community and structure.